

Stormwater Design Standards Manual Educational Workshop #3:

Special Protection Areas & City Watershed Modeling Data

11 June 2020

Agenda

- General Manual Information
- Specific Workshop Information
- General Public Q&A
- Technical Information
 - Special Protection Areas
 - City Watershed Modeling Data
- Technical Q&A



General Manual Information

- Stormwater Design Standards Manual (SWDSM) is a federally mandated requirement of the National Pollution Discharge Elimination System (NPDES) Phase II Stormwater Program
- SWDSM is used by design community to develop designs and used by the City to review, approving, and permitting designs.
- SWDSM has 8 chapters:
 1. Introduction and Legal Authority
 2. Conceptual Overview
 3. Design Requirements
 4. Construction Activity Permitting
 5. Construction Phase
 6. Post-Construction
 7. City Inspection and Enforcement
 8. References
- Originally passed in 2007, first update was completed in 2013
- Newest update goes into effect ***July 1, 2020***

Specific Workshop Information

- Special Protection Areas
- City Watershed Modeling Data





General Public Questions

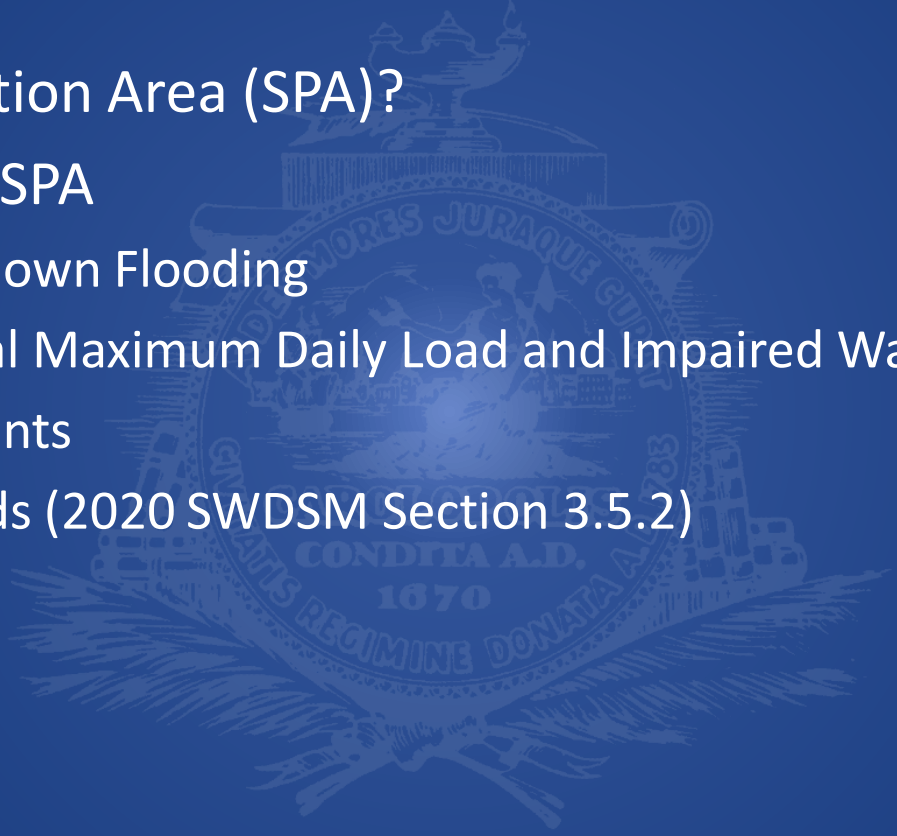
Send questions and comments to:

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Special Protection Area

2020 SWDSM Section 3.6

- What is a Special Protection Area (SPA)?
- Design Requirements in SPA
 - Areas Associated with Known Flooding
 - Areas Discharging to Total Maximum Daily Load and Impaired Waters
 - Basin Specific Requirements
 - Redevelopment Standards (2020 SWDSM Section 3.5.2)
- Determination of SPA



What is a Special Protection Area?

2020 SWDSM Section 3.6

- An area within the City that require additional stormwater management controls due to flooding/water quality concerns
- Areas must comply with a more stringent set of design criteria in addition to the minimum standards and level of service
- Permittee has the responsibility to contact the City through the Technical Review Committee (TRC track) or Department of Stormwater Management (non-TRC track) to determine whether the proposed project site is discharging to a SPA
- The Director of the Department of Stormwater Management shall make the determination on whether a site is within an SPA
- As part of an on-going, concurrent project, SPAs will be available in the City's GIS Portal online in the future.

Design Requirements in SPA – Areas Associated with Known Flooding

2020 SWDSM Section 3.6.1

- The following design criteria shall be used:

For non-SFR sites of 0.5 acres or more, the post-development, peak discharge rates are restricted to one-half the pre-development rates for the 50% and 10% AEP, 24-hour storm events or to the downstream system capacity, whichever is less.

For non-SFR sites of 0.5 acres or more, the post-development runoff volumes for the 50%, 10%, and 4% AEP, 24-hour duration storm events above the pre-development level shall be stored for 24 hours before release. The runoff volume excess between pre-development and post-development must be released steadily over a period of 48 hours after the initial 24 hours of storage.

For SFR or non-SFR of less than 0.5 acres with an increase of 500 square feet of impervious area or more, must offset the increase in runoff through implementation of runoff reduction practices* (e.g., disconnected downspouts, rain garden, infiltration trench, rain barrel).

Per Low Impact Development in Coastal South Carolina: A Planning and Design Guide(Ellis et al. 2014), rain barrels should be used where there is a direct corollary reuse demand. In absence of such, an orifice outlet should be used to slowly drain to impervious surfaces.

*See runoff reduction practices table

- Additional criteria may be required, which should be discussed during the TRC process

Design Requirements in SPA – Areas Associated with Known Flooding

2020 SWDSM Section 3.6.1

- For SFR or non-SFR site < 0.5 acres Table 3-5 in 2020 SWDSM

Runoff Reduction Practice	Requirement
Disconnect Downspouts from Impervious Areas or Piped Systems	500 square feet of impervious area allowed per 500 square feet of roof area disconnected
Install Rain Barrel	500 square feet of impervious area per 50-gallon rain barrel installed
Install Rain Garden	500 square feet of impervious area allowed per 50 square feet of rain garden installed
Install Infiltration Trench	1' deep x 2' wide trench filled with clean sand along each side of surface features such as driveways or patios with no more than 15 feet of linear unit area flowing to the feature

Design Requirements in SPA – Areas Discharging to Total Maximum Daily Load and Impaired Waters

2020 SWDSM Section 3.6.2

- Project site pollutant loads shall be reduced to meet water quality standards for areas discharging to a Total Maximum Daily Load (TMDL) and Impaired Waters
- The following design criteria shall be used:

BMP and Water Quality Analysis

- Follow Design Procedures in 2020 SWDSM Section 3.12

Buffers

- Required along waters to avoid degradation of impaired waterbodies, pending TMDL waterbodies, or anticipated impairment of waterbody
- Base Width shall be 50 feet + 2 feet per 1% slope of the stream valley, centered on the stream
- Slopes over 4H:1V do not count toward base width
- Existing impervious surfaces and wetlands do not count toward buffer width

Design Requirements in SPA – Basin Specific

2020 SWDSM Section 3.6.3

- Basins have been studied in additional detail to develop basin specific requirements
— e.g. Church Creek (2020 SWDSM 3.6.3.1)
- Projects in these areas are required to meet additional basin specific requirements
- Basins may be added or modified by City Council
- Information on the basins are maintained on the City's website:
<https://www.charleston-sc.gov/2144/Stormwater-Management>
- Permittee has the responsibility to contact the City through the Technical Review Committee (TRC track) or Department of Stormwater Management (non-TRC track) to determine whether the proposed project site is discharging to a SPA with basin specific requirements

Design Requirements in SPA – Redevelopment Standards

2020 SWDSM Section 3.5.2

- In addition to meeting the redevelopment standards (SWDSM Section 3.5.1), redevelopment in a SPA must also include:

For SFR sites of a half acre or more but less than 1 acre, no increase in 24-hour discharge volume for the 50%, 10%, and 4% AEP storm events.

For SFR site areas of 1 acre or more, achieve a 20% reduction for the 50%, 10%, and 4% AEP storm event peak flow and 24-hour discharge volume.

However, no site shall be required to reduce below the values for an undeveloped site with the assumption of cover as fair condition open space.

For SFR or non-SFR of less than a half acre with an increase of 500 square feet of impervious area or more, offset the increase in runoff through implementation of runoff reduction practices* (e.g., disconnected downspouts, rain garden, infiltration trench, rain barrel).

Per Low Impact Development in Coastal South Carolina: A Planning and Design Guide (Ellis et al. 2014), rain barrels should be used where there is a direct corollary reuse demand. In absence of such, an orifice outlet should be used to slowly drain to impervious surfaces.

*See runoff reduction practices table

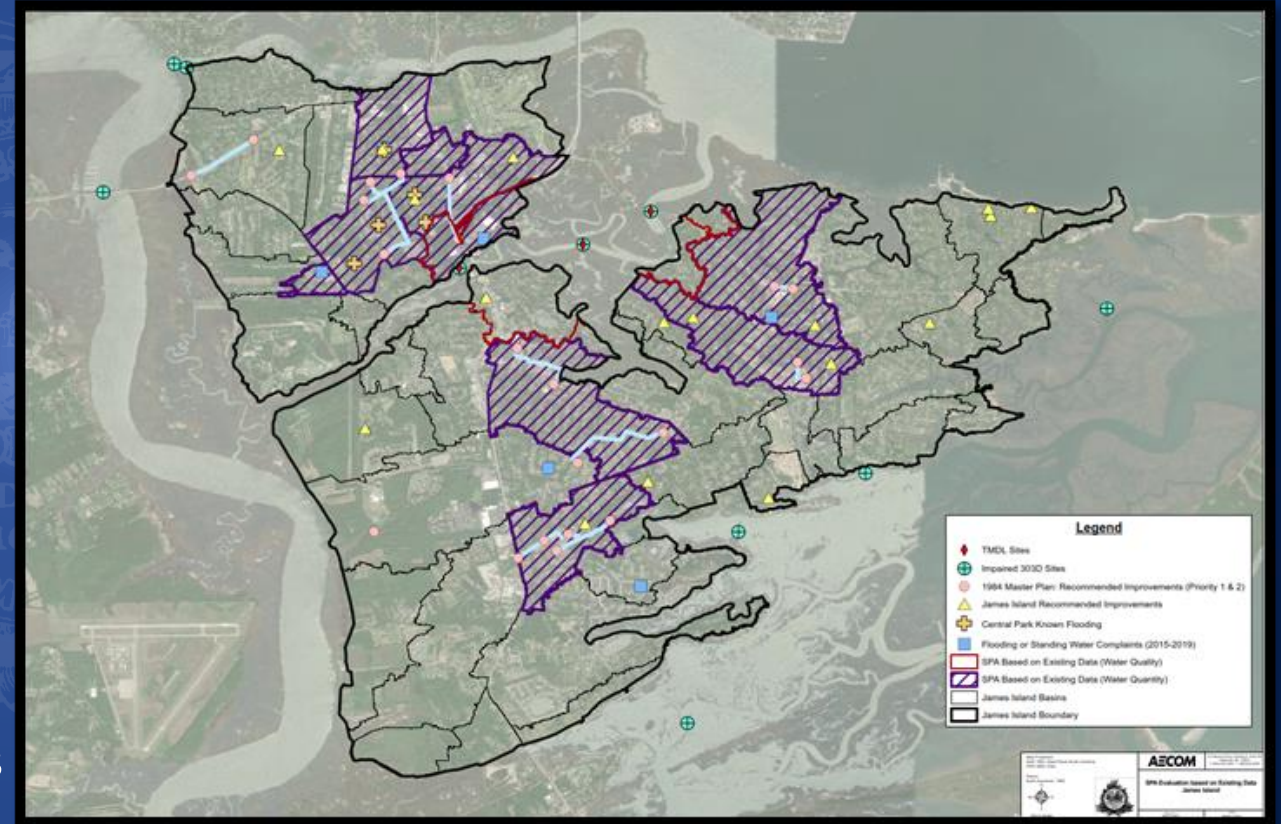
Determination of SPA

- SPAs for each watershed determined based on two-step process:
- **Step 1** – Evaluation based on Existing Datasets related to
 - Potential Flooding Locations
 - Water Quality Concerns
- **Step 2** – Desktop Analysis



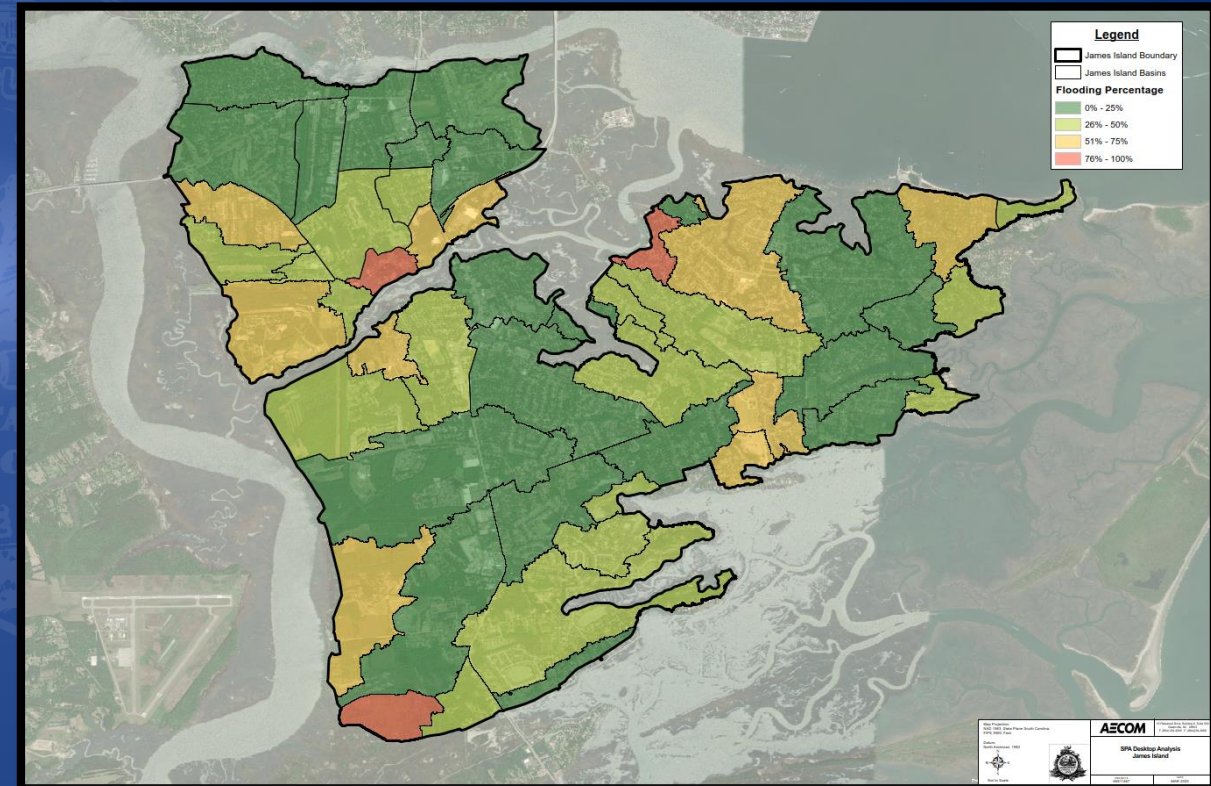
Determination of SPA – Existing Datasets

- **Step 1** – Evaluation based on Available Existing Information related to
 - Potential Flooding Locations
 - Water Quality Concerns
- Some of the existing datasets evaluated included the following:
 - City of Charleston 1984 Master Drainage and Floodplain Management Plan
 - Available City's watershed models and associated Stormwater Management Report/Studies that shows the recommended improvements
 - Historical Flooding/Standing Water Complaints from City's Database
 - Impaired 303(d) listed sites and locations of the monitoring stations



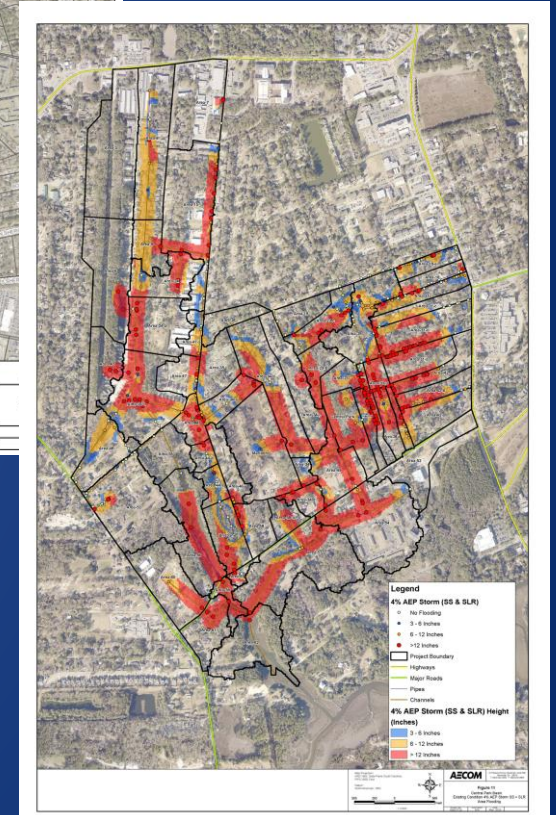
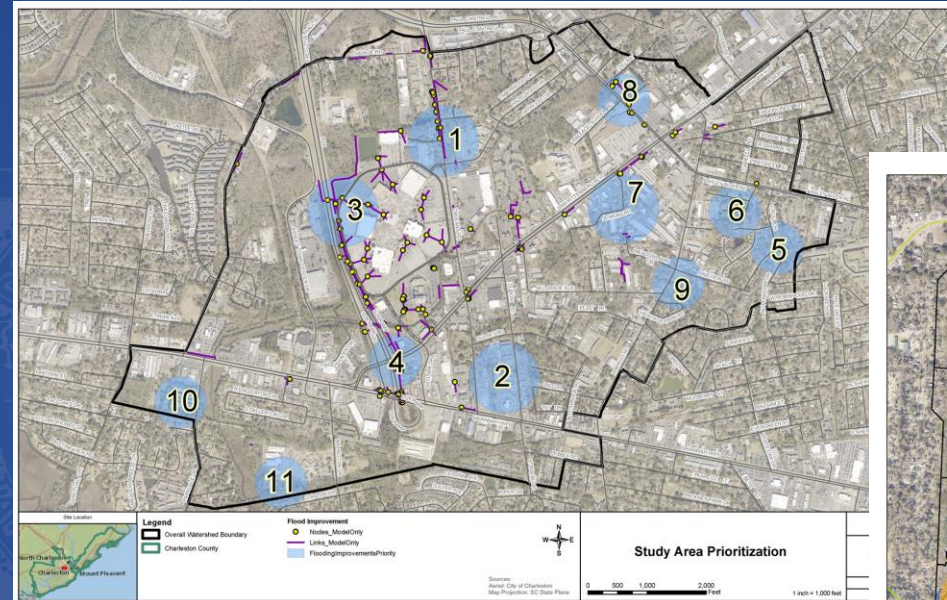
Determination of SPA – Desktop Analysis

- **Step 2** - Identifying SPAs based on Desktop Analysis.
 - Performed for basins within the watershed that do not have adequate information/model data.
 - Not a detailed Hydrologic/Hydraulic Model, but high-level engineering assessment of the watershed based on engineering calculations
- One of the criteria used to determine SPA is:
 - Percentage of the total area of the basin that floods is calculated based on the maximum stage in that basin and the DEM. If the calculated percentage of flooding is over a certain threshold, typically 50%, then the basin is identified as potential SPA



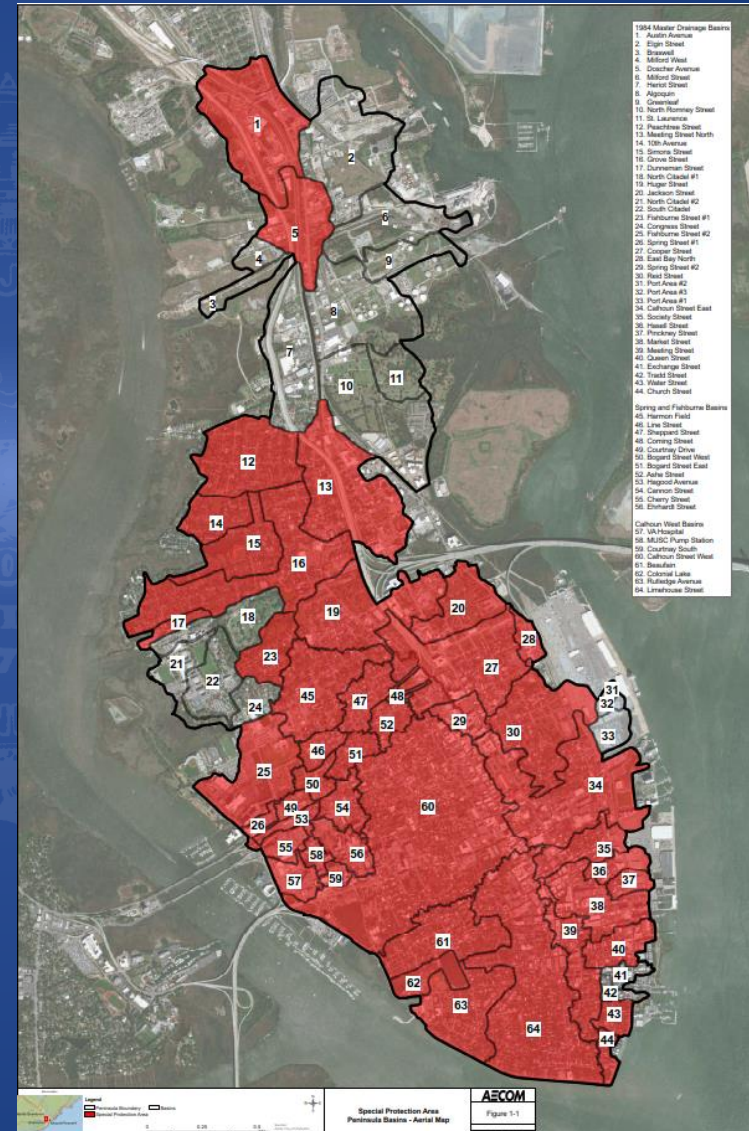
Determination of SPA – Desktop Analysis Benefits

- Aid the City in determining whether a sub-basin has a potential to be designated as an SPA
- Ability for the City to prioritize in selection of basins within a watershed for future modeling efforts/improvements



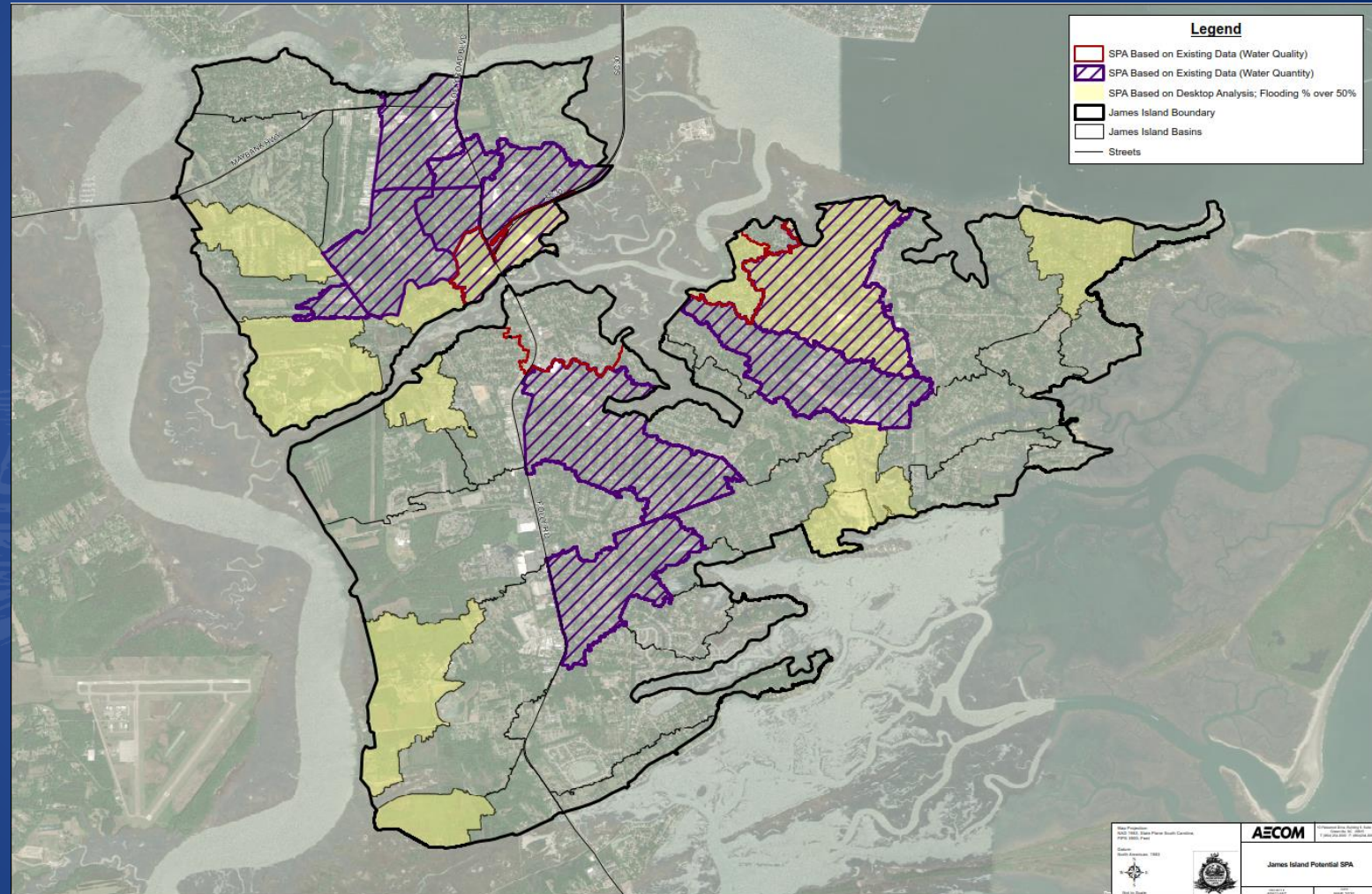
Peninsula Watershed SPA Map

- Under review
- Analysis Performed based on
 - Existing Dataset including areas with Hydrologic and Hydraulic Modeling



James Island Watershed SPA Map

- Under Review
- 4% AEP
- Analysis Performed based on
 - Existing Dataset
 - Desktop Analysis



Other SPA Maps Under Development

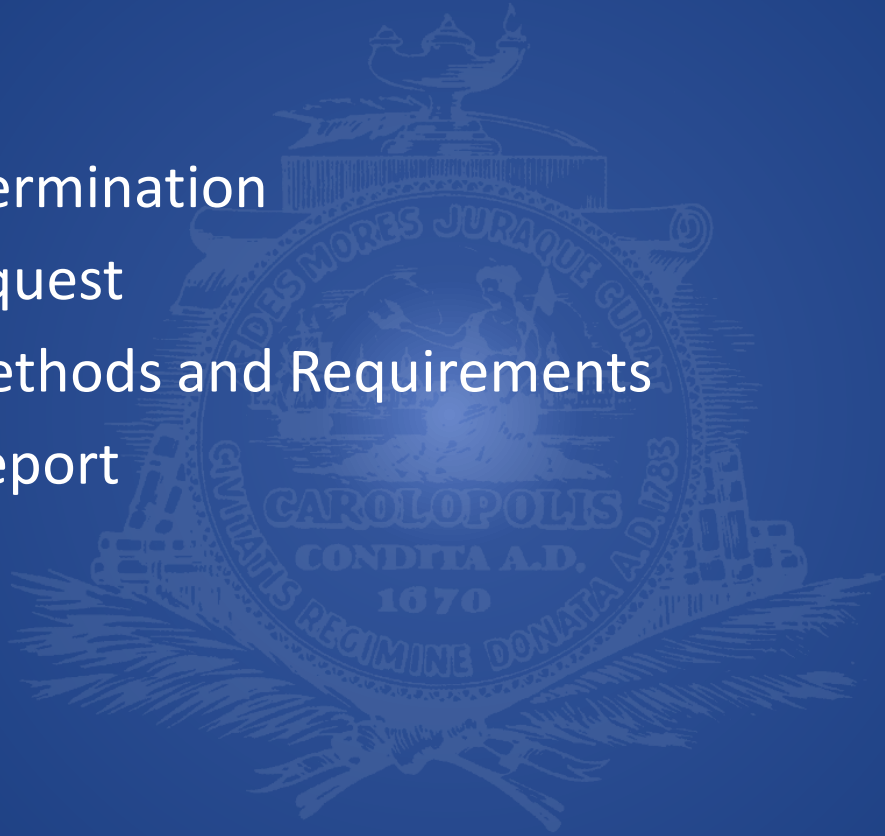
- West Ashley
- Johns Island
- Daniel Island/Cainhoy



City Modeling Data

Technical Procedure Document #5

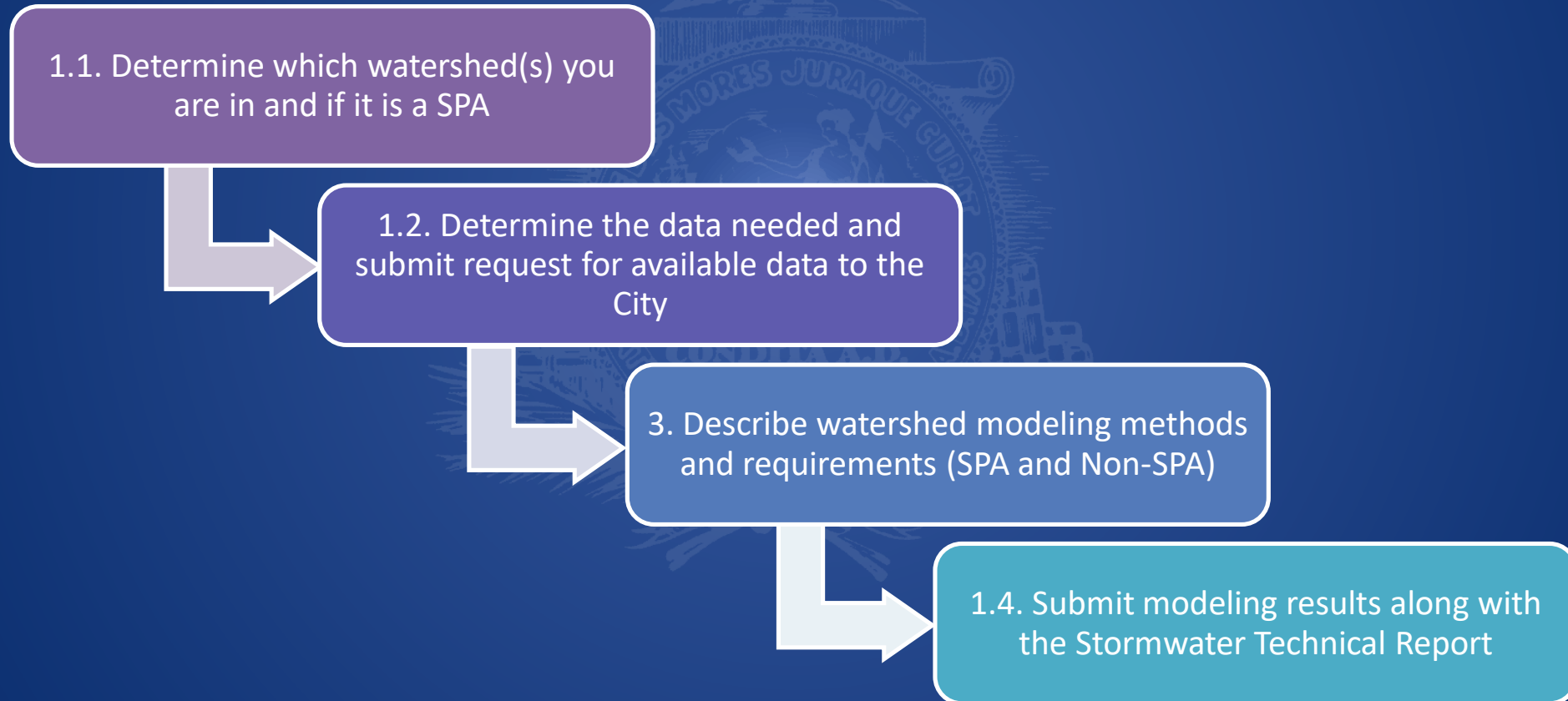
- General Steps
- Watershed and SPA Determination
- Data Availability and Request
- Watershed Modeling Methods and Requirements
- Stormwater Technical Report



City Modeling Data – General Steps

Technical Procedure Document #5

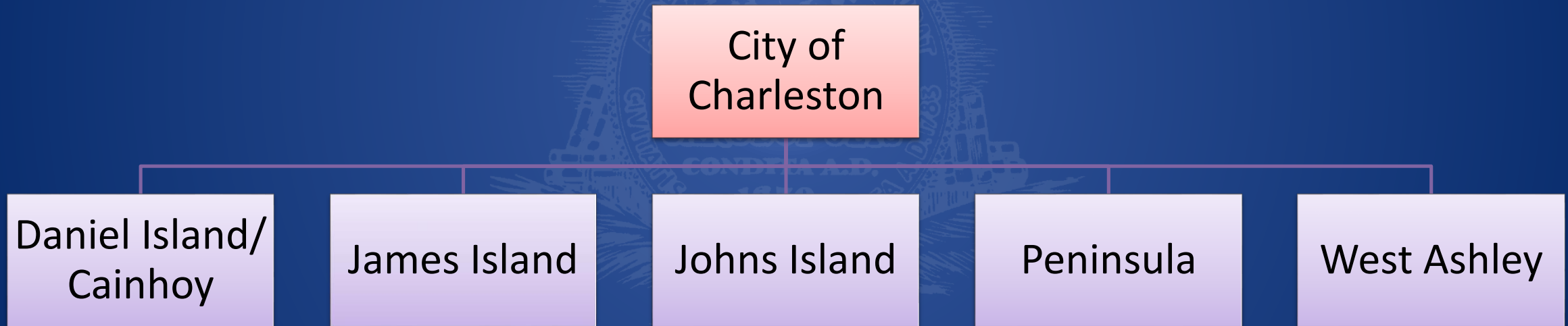
- General Steps required to develop a site in any watershed within the City includes:



City Modeling Data – Watersheds and Special Protection Areas

Technical Procedure Document #5

- The first step in the process is to identify the watershed where the development is planned
- City is divided into five (5) main geographical areas



- Within each geographical area, specific sub-basins are identified and designated as a SPA (Requirements are in 2020 SWDSM Section 3.6)

City Modeling Data – Watersheds and Special Protection Areas

Technical Procedure Document #5

- Permittee has the responsibility to contact the City through the Technical Review Committee (TRC track) or Department of Stormwater Management (non-TRC track) to determine whether the proposed project site is discharging to a SPA
- City will make SPA files available through the GIS Portal (<https://data-charleston-sc.opendata.arcgis.com/>) in the near future
- There will a more informative webpage available in the future with specific information related to SPA

City Modeling Data – Data Availability and Request

Technical Procedure Document #5

- The developer/designer has the responsibility to request data for the watershed to perform appropriate analyses
- Formally request this data by sending an email to the Department of Stormwater Management with the watershed name, basin name, and general description of the data being requested (email Anthony Giraldo: giraloa@charleston-sc.gov)
- GIS Data can be found online at <https://gis.charleston-sc.gov/>
- Datasets needed for analysis include:
 - Available Model Data and Boundary Conditions
 - Previous Master Plan Reports/Studies
 - Record Drawing/As-builts
 - GIS Datasets and Maps

City Modeling Data – Watershed Modeling Methods and Requirements

Technical Procedure Document #5

- 2020 SWDSM Section 3.4.4.2
- If a Master Plan and/or Model is available, the proposed development must use boundary conditions from the model to confirm all stormwater requirements are fulfilled. As stated in 2020 SWDSM Section 3.9.4:

If a project is in an area that has a stormwater master plan and model, the analysis shall use the boundary conditions from the master plan model provided by the City. The model shall extend up to the top of the water and down to the project. If the modeling results indicate there is an impact [listed in SWDSM Section 3.9.4], then stormwater volume and flowrate leaving the site must be reduced until such a point that there are no impacts

- Current Master Plan and/or Models are listed in *Technical Procedure Document #5: City Watershed Modeling Data*

City Modeling Data – Watershed Modeling Methods and Requirements

Technical Procedure Document #5

- Model parameters are developed and calibrated on a Regional Scale
- If the site does not have a City Model, then a model must be created using:
 - The 1% AEP Storm Event Analysis Procedure (see Technical Procedure Document #4)
 - Default Peaking Factor of 484 unless justification for a Modified Peaking Factor (see Technical Procedure Document #3 Peaking Factor) is approved
- Developers/designers may select an appropriate modeling program for site conditions
 - If backwater, tailwater, and tidal conditions are not present and storm drainage systems have less than five (5) connections programs with Manning's Equation is satisfactory
 - Otherwise a program with Saint-Venant equations is required

City Modeling Data – Stormwater Technical Report

Technical Procedure Document #5

- Requirements for Stormwater Technical Report are outlined in Section 4.5 and the Guidelines and Checklist Appendices of the 2020 SWDSM
- In addition, Stormwater Technical Report must include:
 - Model information (including name, version, and methodology)
 - Input report with the City-provided boundary conditions (upstream and downstream)
 - Pre-Development Time Series Report for the Upstream and Downstream Boundary Nodes provided by the City
 - Post-Development Time Series Report for the Upstream and Downstream Boundary Nodes provided by the City
- Any updates to the Stormwater Technical Report as a result of comments received by the City shall be resubmitted per the process outlined in *Technical Procedure Document #1: Stormwater Permitting Process*

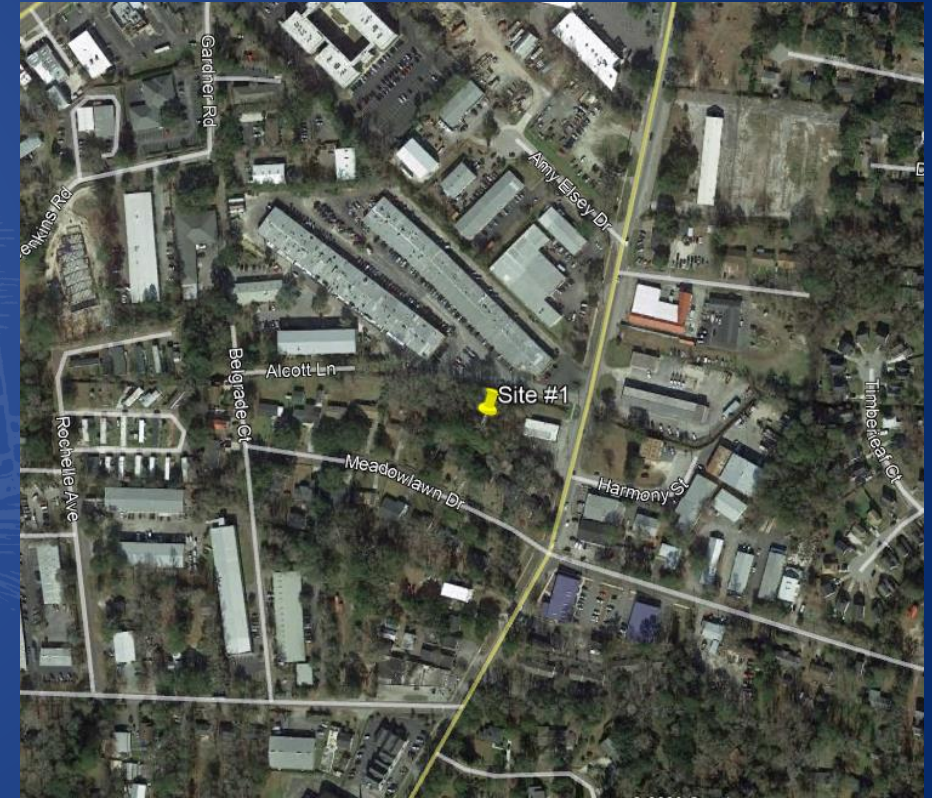
Record Drawings

Technical Procedure Document #5

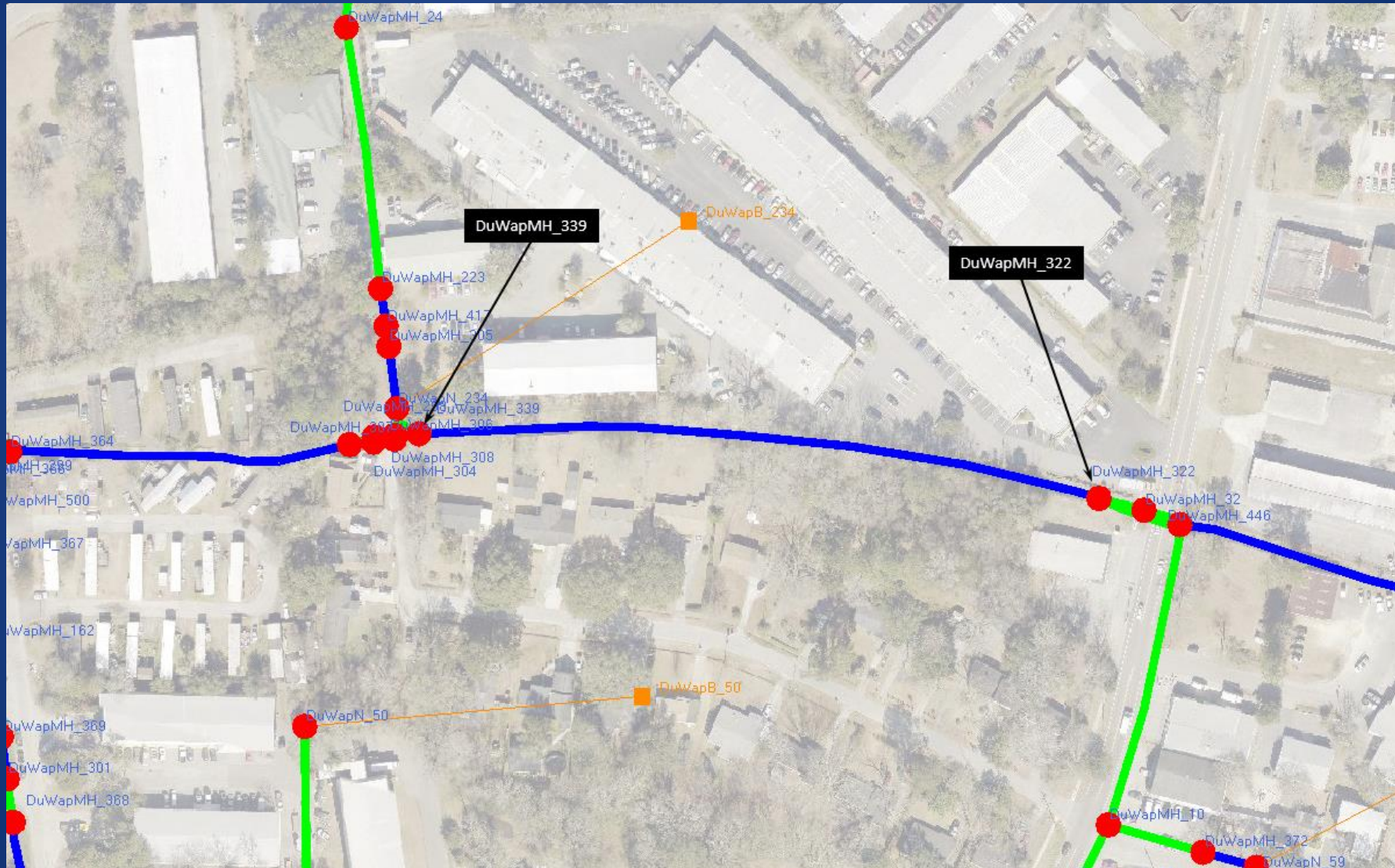
- Final deliverables may require an updated project H&H model, if the Record Drawings show design elements were not constructed in accordance with approved plans
- Digital copies of the Record Drawings must be submitted with a data structure compliant with the City's GIS standards
- The Record Drawing preparer should coordinate with the City's Stormwater Development Manager for the appropriate GIS data structure prior to submittal to the City

Example Project #1

- New 26,800 SF GA Building and associated parking
- Total Project Site Area = 1.5 ac
- Disturbed Area = 0.9 ac
- Pre-developed Conditions = Impervious build-out for retail
- Post-developed Conditions = Impervious build-out for lab building
- Outfall from detention pond to existing channel
- This site is within a watershed with an established Master Plan and Model and located in a SPA.



Example Project #1





Technical Q&A

Send questions and comments to:

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